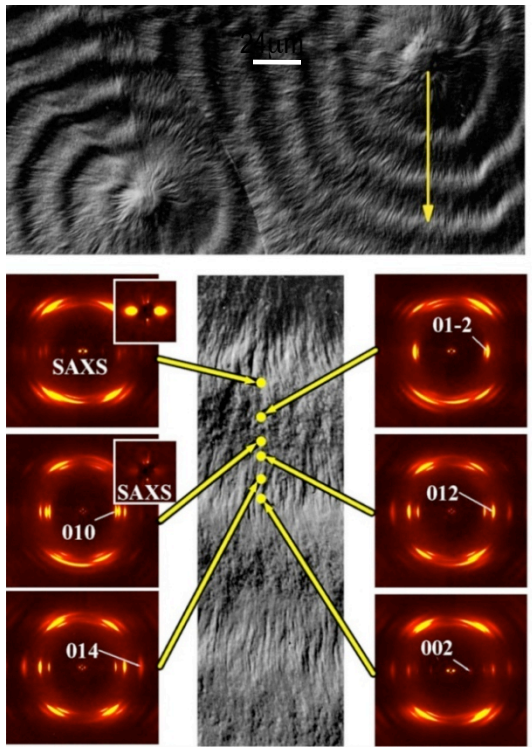
Multiscale X-ray Diffraction (MXD)

MXD at NSLS-II

- X-ray spot sizes can be varied from 30nm to 3 microns
- Spot is stable due to virtual source optics layout
- Optics designed to collect all possible flux from source
- Large working distance ≥ 0.1m enables different sample environments; UHV, diamond anvil cells with laser heating, humidity cells, sample visualization, etc.
- Coherent illumination of sample possible

Examples of Science Areas & Impact

- Bio-materials with hierarchical, multiscale feature
- Combinatoric material studies enabled by small beams
- Resolving strain fields of individual dislocations
- Strain in semiconductor devices and materials
- Spatially resolved diffraction from complex materials
- Nano-crystallography
- Structure and dynamics of unconventional domain configurations in complex oxides



Top left: Confocal scanning optical micrograph of a PTT film, as used for the microfocus x-ray experiments. The film clearly shows a banded spherulitic texture. The direction of scanning is indicated by the yellow arrow.
Bottom left: Set of x-ray diffraction patterns corresponding to the maximum intensity of the indexed reflection as a function of radial position relative to the banded morphology.
Figure courtesy of D. A. Ivanov and M. Rosenthal (Thesis 2010).

Beamline Capabilities

TECHNIQUE(S): Primarily diffraction- centric detectors, but secondary detectors for fluorescence

SOURCE: undulator

ENERGY RANGE / RESOLUTION: 5 keV-30 keV / 2 eV

SPATIAL RESOLUTION: ~30nm to 3microns

U.S. DEPARTMENT OF ENERGY

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